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Global Annual Snow Accumulation by Months

Charles Schutz, L. D. Bregman

February 1988

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N-2687-RC

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PREFACE

The data presented in this Note represent an attempt to gather in one place and one format all available analyses and observations of annual snow accumulation by months from around the globe up to 1976. Methodologies were developed to show the global snow-depth data as a set of compatible mean-monthly snow accumulations, as of the last day of each month. The resulting climatological summary has been used for a comparison with snow-depth computations from a general circulation model (GCM). The data have also been useful for initializing GCM calculations.

The snow-accumulation climatology was originally developed as part of the RAND/National Science Foundation/Defense Advanced Research Projects Agency Climate Program, one of whose aims was the systematic comparison of model simulations with observed climate. Data more recent than 1976 have not been collected, since the Climate Program has not been continued at RAND. Other RAND publications related to the subject are the seasonal *Global Climatic Data for Surface, 800 mb, 400 mt* by C. Schutz and W. L. Gates, which appears in R-915-ARPA, R-915/1-ARPA, and R-915/2-ARPA for January, R-1317-ARPA for April, R-1029-ARPA and R-1029/1-ARPA for July, and R-1425-ARPA for October. These climatologies are available from the RAND Publications Department, and the tabulations in this Note are available on tape from the Data Facility within RAND's Computer Information Systems Department.

RAND Corporation funds were used to prepare and publish this Note.

SUMMARY

The compilation of observed mean monthly snow accumulations for the globe was taken from a variety of climatological sources and formats. They were reformatted to fit the global 4° latitude by 5° longitude grid of the RAND coupled two-level oceanic and two-level atmospheric general circulation model (GCM). The results are presented in the form of machine-analyzed isopleths on global maps, global grid-point tabulations, and global means. These products were used at RAND to initialize GCM calculations, to facilitate comparisons with global integrations from the GCM, and as a global climatological summary.

The snow-accumulation data given here were derived from observed data from various sources, presented in a variety of formats. Most of the monthly measurements were from scheduled snow-depth observations made in the Northern Hemisphere that were published before 1976. These data were gathered and developed into monthly climatologies, expressing conditions representative of the last day of each month, by the U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL). To supplement the CRREL summaries, a pseudoclimatology of monthly snow accumulations was developed at RAND for the 4° latitude by 5° longitude grid points through the data-sparse areas of China, Greenland, the Arctic basin, and the Antarctic. Our methodology included an empirical evaluation of many regularly observed weather variables, including precipitation and temperature, taking into account cyclone tracks, weather source regions, and other items. Air mass modification as related to latitude and terrain was also considered.

Monthly ice-pack limits from the U.S. Navy Oceanographic Office were used to extend the "zero" snow-accumulation line over the oceans. Unfortunately, through Africa and South America, where the only accumulation is on the highest mountains, RAND's 4° by 5° grid was too coarse to pick up the variations. However, not more than two grid points were involved. The net result is what we consider to be the best mean-monthly snow-depth climatology currently available for the globe.

ACKNOWLEDGMENTS

Sincere appreciation is extended to analysts at the Cold Regions Research and Engineering Laboratory (CRREL), Corps of Engineers, U.S. Army, for sharing their many atlases and reports on snow research. We would also like to thank Professor N. Untersteiner of the University of Washington for his helpful suggestions and review of the evaluation of Arctic snow conditions and Professor Arnold Court of California State University, Northridge, for his significant contributions. Thanks are also extended to several RAND colleagues: to E. S. Batten and M. E. Schlesinger, who originally suggested the investigation, and to W. L. Gates, H. B. Henning, and R. R. Rapp, who reviewed the manuscript at various times and extended many valuable suggestions.

At the time of his death, Charles Schutz left a nearly complete manuscript of this Note. His manuscript was edited and put into final form for publication by F. W. Murray.

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I. INTRODUCTION

The climatological data presented in this Note describe the global distribution of mean-monthly snow accumulations shown in the form of tabulations for the grid used by the RAND general circulation model (GCM)[1]. The nodes of the grid are at intervals of 4° latitude from 2°N to the poles and of 5° longitude from the prime meridian east and west. The singularities at the North and South Poles are each represented as 72 separate grid points with common values. Figures A.1 and A.2 in the appendix show the locations of the grid points as plotted on polar stereographic maps.

The original data came from a variety of sources and formats. Most of the reported monthly measurements were from scheduled snow-depth observations in the Northern Hemisphere. For the most part, the measured snow depth at a given time is the same as the net accumulation from the beginning of the snow season up to that time. Over permanent ice caps, as in Greenland and Antarctica, there must be some modification of this concept, for the snow depth may technically be considered to be hundreds or thousands of meters, with an accumulation period measured in millenia. Thus in this study it is proper to speak of monthly *accumulation* as the total amount of snow that fell during the month less any loss to evaporation and melting. Where there is no ambiguity, *depth* can be substituted for *accumulation*.

Monthly accumulations from the data-sparse areas of Greenland, the Arctic basin, the Antarctic, and China were carefully contrived from a combination of whatever observed weather variables were available, including precipitation and temperature, weather sources, air masses, and so forth. Storm track and terrain considerations were used to limit interpolation between isolated data points. Great care was also taken to consider other sources of accumulation, such as deposition (hoarfrost), drifting snow, and the accumulation of ice crystals. In these cases, stratigraphic (core-type) measurements proved a useful source of information. Therefore, the resulting grid-point data are a

one-of-a-kind climatology based on snow depth and associated weather observations, global weather patterns, and a great deal of synoptic experience.

Data selection and processing and the methodologies used for developing global mean-monthly snow-depth values for data-sparse areas are discussed in Sec. II. The appendix contains tabulations of mean-monthly snow accumulation at each node of the 4° by 5° global grid for each of the 12 months. The number 0 in the tabulations denotes either zero accumulation or missing data, whereas the number 1 represents a trace. All data represent conditions on the last day of the month.

II. DATA SELECTION AND PROCESSING

This section briefly describes the data sources and methodologies used in processing the snow-related data. After a careful review of all known data sources, we feel confident that the material presented here represents the best snow-depth climatology available through 1975. These tested data can be used for initializing a GCM, for comparison with a model's global simulations, or separately as a climatological summary. A cursory review of the content, processing, and limitations of each data set follows. However, the most complete information covering our selected data will be found in the referenced publications.

Snow accumulation may not always result entirely from precipitation, since blowing snow, ice crystals, rime ice, hoarfrost, and the like also contribute to the total. However, most accumulations from these sources are small and difficult to evaluate, so, unless otherwise noted, only snow accumulated from precipitation is represented here.

NORTHERN HEMISPHERE

Except for Greenland, the Arctic basin, and China, Northern Hemisphere data were taken largely from observations of mean-monthly snow depths compiled by analysts at the U.S. Army's Cold Regions Research and Engineering Laboratory (CRREL) [2]. These Army records cover a period of approximately 20 years; however, CRREL did not prepare maps for the data-sparse months of June, July, August, and September. For the present study, breaks in the isopleths on the Army maps that were available were filled in by consulting temperature and snow data from supplementary sources, including an Atlas of Chinese Climatology [3], Soviet data from Borisov [4] and Rikhter [5], Dickson and Posey [6], and U.S. data from the Department of Commerce [7]. The Army data were further expanded during the coldest months with mean monthly ice limits from the U.S. Navy Hydrographic Office [8].

An attempt was made to develop snow accumulation values over water areas that are completely or mainly covered with pack ice. For this purpose, the "zero" snow accumulation lines were taken to be the boundaries of areas of greater than 5/10 sea ice cover as shown in Ref. 8. All grid points that fell within these lines in a particular month were given snow-accumulation values. For example, the Sea of Okhotsk and the South Bering Sea between the USSR and Alaska are usually covered by ice during January, February, March, and April. Snow accumulations assigned to the grid points during these four months reflect values at surrounding land points. All of the "supplemental" grid-point data for each month were stretched empirically. Special attention was given to the precipitation patterns, temperature, cyclone paths, air mass modification, latitude, and terrain.

GREENLAND

Greenland is a massive island, ice-covered and uninhabited beyond its coasts, extending from about 60°N to 82°N and from 12°W to 72°W , as shown in Fig. 1, after Bader [9]. Thirty-four grid points on the RAND 4° latitude by 5° longitude grid are fully representative of the ice cap. A number of other points represent varying proportions of land and the surrounding waters. All 13 weather reporting stations are along Greenland's coasts, as shown in Fig. 1 and listed in Table 1. This station distribution complicated our computations of snow accumulations, since the ice cap rises to about 3000 m in a broad plateau centered near 72°N , 40°W (dashed contours in Fig. 1).

Weather systems that regularly invade Greenland are dramatically modified by the orographic effect of the ice cap, and precipitation amounts vary greatly from the coast inland. The solid isopleths in Fig. 1 further indicate that the annual water equivalent precipitation (expressed in mm) is greatest south of 72°N and in the west. Therefore, Greenland's data-sparse interior proved to be a complicated and difficult area for which to develop a realistic snow-accumulation climatology. Since virtually the entire island is covered with a deep permanent layer of snow and ice, the present study is concerned only

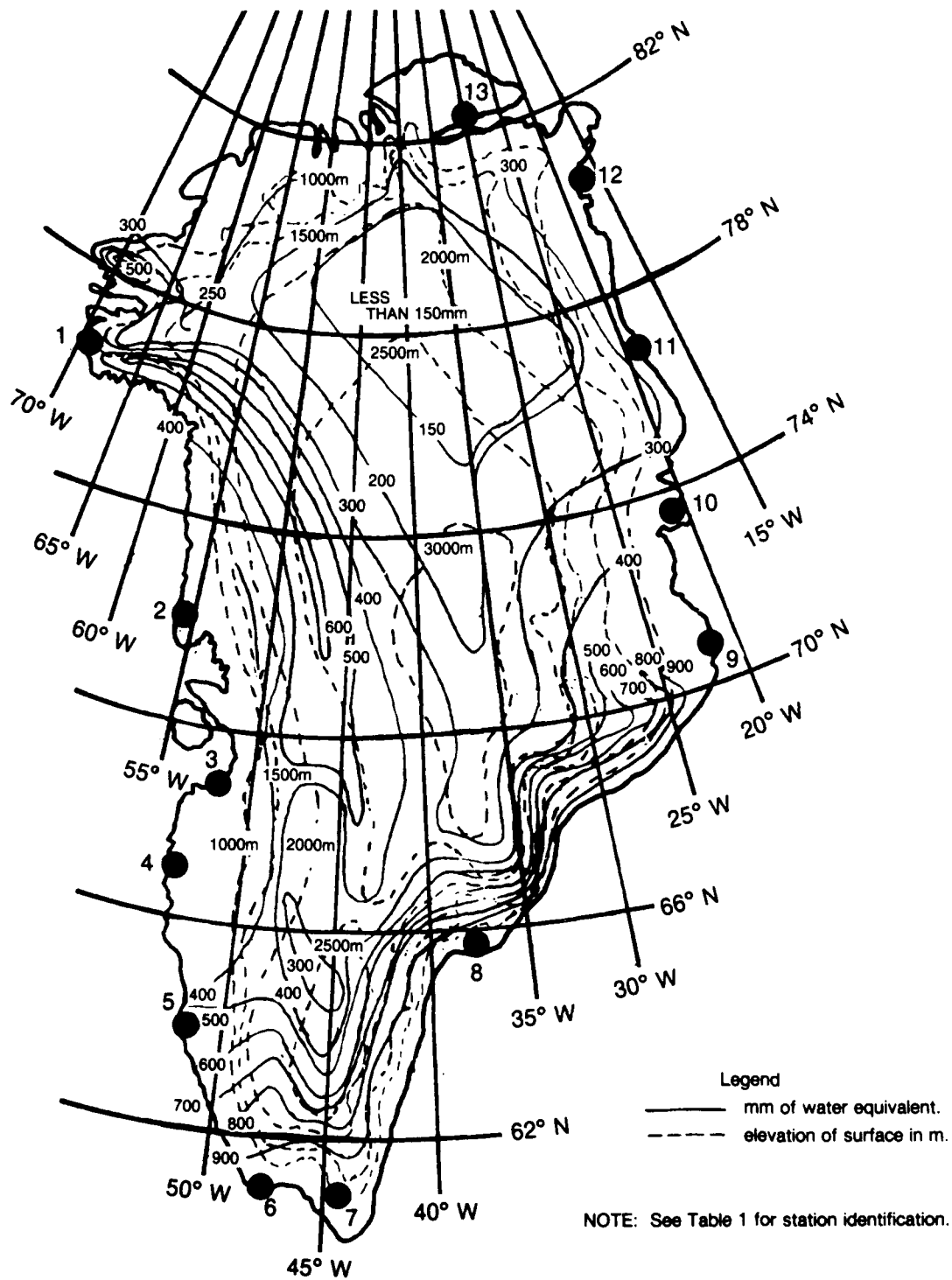


Fig. 1—Mean annual accumulation of snow in Greenland, after Bader [9]

Table 1

STATION LOCATION, ELEVATION, AND MONTHLY AND ANNUAL PRECIPITATION: GREENLAND

Location	Month												Ann.	Years of Record	Elev. (m)	
	S	O	N	D	J	F	M	A	M	J	J	A				
a. West Coast -- All Latitudes																
1. Thule (76°31'N 68°44'W)	mm	16	17	13	6	9	9	5	4	6	6	17	15	122	12	77
	%	13	14	11	5	7	7	4	3	5	5	14	12	100		
2. Upernavik (72°47'N 56°10'W)	mm	30	23	17	11	9	11	9	11	11	9	21	24	186	10-25	35
	%	16	12	9	6	5	6	5	6	6	5	11	13	100		
3. Jakobshavn (69°13'N 51°03'W)	mm	41	29	21	18	10	13	14	15	20	19	35	34	269	19-26	31
	%	15	11	8	7	4	5	5	6	7	7	13	13	101		
4. Holstensborg (66°56'N 53°39'W)	mm	39	37	29	18	17	4	4	8	11	16	44	41	267	6	27
	%	15	14	11	7	6	2	2	3	4	6	17	15	102		
5. Godthaab (64°10'N 51°45'W)	mm	84	71	44	20	26	24	18	25	29	46	59	69	515	19-26	20
	%	16	14	9	4	5	5	4	5	6	9	12	13	102		
Average:		%	15	13	10	6	5	5	4	5	6	6	13	13		
Accumulated:		%	15	28	38	44	49	54	58	63	69	75	88	101		
b. Southeast Coast -- Near 62°N and 66°N																
6. Ivigtut (61°12'N 48°10'W)	mm	162	172	146	77	92	129	87	79	89	96	82	97	1308	19-22	30
	%	12	13	11	6	7	10	7	6	7	7	6	7	99		
7. Nanortalik (60°08'N 45°13'W)	mm	119	125	94	52	64	71	41	59	45	80	53	92	895	9-15	7
	%	13	14	11	6	7	8	5	7	5	9	6	10	101		
8. Angmagssalik (65°37'N 37°39'W)	mm	76	90	86	68	58	82	62	53	54	44	35	62	770	16-26	29
	%	10	12	11	9	8	11	8	7	7	6	5	8	102		
Average:		%	12	13	11	7	7	10	*7	7	6	7	6	8		
Accumulated:		%	12	25	36	43	50	60	67	74	80	87	93	101		
c. East Coast -- Near 70°N																
9. Scoresbysund (70°25'N 21°58'W)	mm	53	56	44	64	29	29	23	21	12	26	38	33	428	17-26	17
	%	12	13	10	15	7	7	5	5	3	6	9	8	100		
Accumulated:		%	12	25	35	50	57	64	69	74	77	83	92	100		

Table 1 (Continued)

Location	Month												Ann.	Years of Record	Blev. (m)	
	S	O	N	D	J	F	M	A	M	J	J	A				
d. East Coast -- Near 74°N, 78°N, and 82°N																
10. Myggbukta	mm	21	23	31	39	44	30	24	15	9	13	20	29	298	19-20	2
(73°29'N 21°34'W)	%	7	8	10	13	15	10	8	5	3	4	7	10	100		
11. Danmarkshavn	mm	8	8	25	18	31	18	18	3	5	5	1	15	152	2	7
(76°46'N 19°00'W)	%	5	5	17	12	20	12	12	2	3	3	1	10	102		
12. Nord	mm	21	16	35	37	23	20	8	5	3	5	12	19	204	4-5	35
(81°36'N 16°40'W)	%	10	8	17	18	11	10	4	3	2	3	6	9	101		
Average:	%	7	7	15	15	15	11	8	3	3	3	5	10			
Accumulated:	%	7	14	29	44	59	70	78	81	84	87	92	102			
e. Miscellaneous																
13. Peary Land	mm	13	15	3	3	1	5	1	1	1	5	5	5	58	2	9
(82°10'N 30°30'W)	%	22	26	5	5	2	9	2	2	2	9	9	9	102		
Accumulated:	%	22	48	53	58	60	69	71	73	75	94	93	102			

Source: References 10,12.

with the depth of snow that is accumulated during a particular month or since the beginning of the current snow season in midsummer.

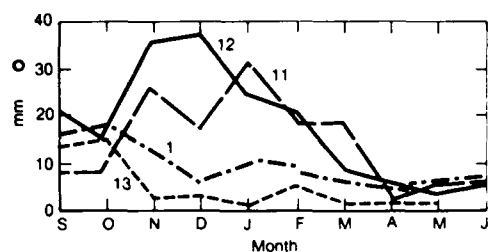
Weather systems, or storms with their low-pressure centers and associated frontal patterns, are the source of most of Greenland's precipitation [10]. For example, southeastern Greenland is near the climatological center of the vigorous Icelandic Low storm track [11], which accounts for the large mean annual accumulation south of 72°N. Greenland also comes under the influence of storms originating in Canada and the United States. As another complication, storms from the west are most active in the late summer and fall, with peaks from July to October (Table 1a), while those affecting the east coast are most active in winter, with peaks from November through January (Table 1c and 1d). Stations south of 66°N (Table 1b) are affected by weather systems from both west and east, resulting in a double precipitation maximum, with

peaks in both October and February. For a better understanding of these variables, the precipitation data in Table 1 were plotted in latitude segments in Fig. 2. These graphs of precipitation show dramatically where the weather systems are most active.

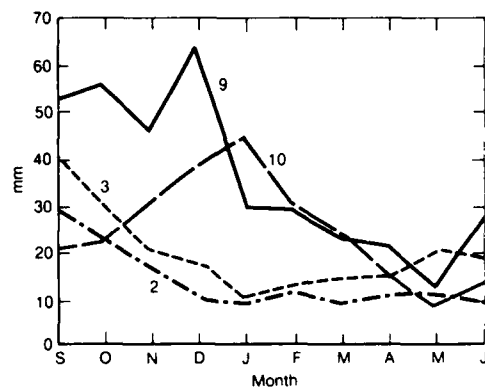
A methodology was devised to calculate the mean monthly snow accumulations at the 34 grid points using only the annual "water equivalent" accumulation (Fig. 1) and the monthly precipitation data (Table 2). These are independent data sources, and there is some apparent disagreement in annual accumulations between them. However, our methodology uses the Bader analysis (Fig. 1) to define the spatial distribution of snow amounts and employs the tabulated data only to define the relative temporal (month by month) distributions.

The station data were sorted by latitude bands as shown in Table 1 and then normalized as a percentage of the annual mean. The start of snow accumulation in Table 1 was based in part on data from Putnins [10], who indicated that actual snow depths are greatest in April and least in August. Putnins also stated that south of the Arctic Circle (about 66°N) snow seldom occurs in June, July, or August (summer) and that to the north up to 84 percent of the precipitation falls by June. This assertion was verified by accumulating the normalized mean-monthly station precipitation beginning in September, normally the first month of snow accumulation (Table 1). Mean monthly snow depths from the Arctic Construction and Frost Effects Laboratory (now CRREL) [2] and Untersteiner [13] further refined the results of Putnins [10]. They showed that at various Northern Hemisphere stations between 64°N and 71°N , there is a rapid decline with latitude in snow accumulation (Fig. 3). On the basis of these data, and the fact that Greenland extends from 60°N to 82°N , we used March as the 100 percent snow-accumulation month between 62°N and 66°N , April between 70°N and 74°N , and May between 78°N and 82°N (Table 2).

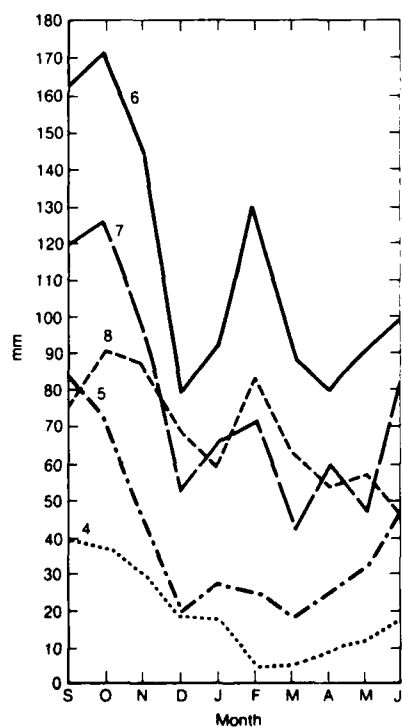
Since snow seldom occurs in summer south of about 66°N , May became the first zero-accumulation month between 62°N and 66°N , June between 70°N and 74°N , and July between 78°N and 82°N . The normalized snow-accumulation data shown in Table 2 were further refined by dividing the latitude bands into west and east sectors through Greenland's highest



Latitude Zone 78°-82° N			
Station Number	Station Name	Coast	Annual Precipitation (mm)
12.	Nord	E	204
11.	Danmarkshavn	E	152
13.	Peary Land	N	58
1.	Thule	W	122



Latitude Zone 70°-74° N			
Station Number	Station Name	Coast	Annual Precipitation (mm)
9.	Scoresbysund	E	428
10.	Myggbukta	E	298
3.	Jakobshavn	W	269
2.	Upernavik	W	186



Latitude Zone 62°-66° N			
Station Number	Station Name	Coast	Annual Precipitation (mm)
6.	Ivigut	S	1308
7.	Nanortalik	S	895
8.	Angmagssalik	S	770
5.	Godthaab	W	515
4.	Holstenborg	W	267

NOTE: See Table 1 for station identification.

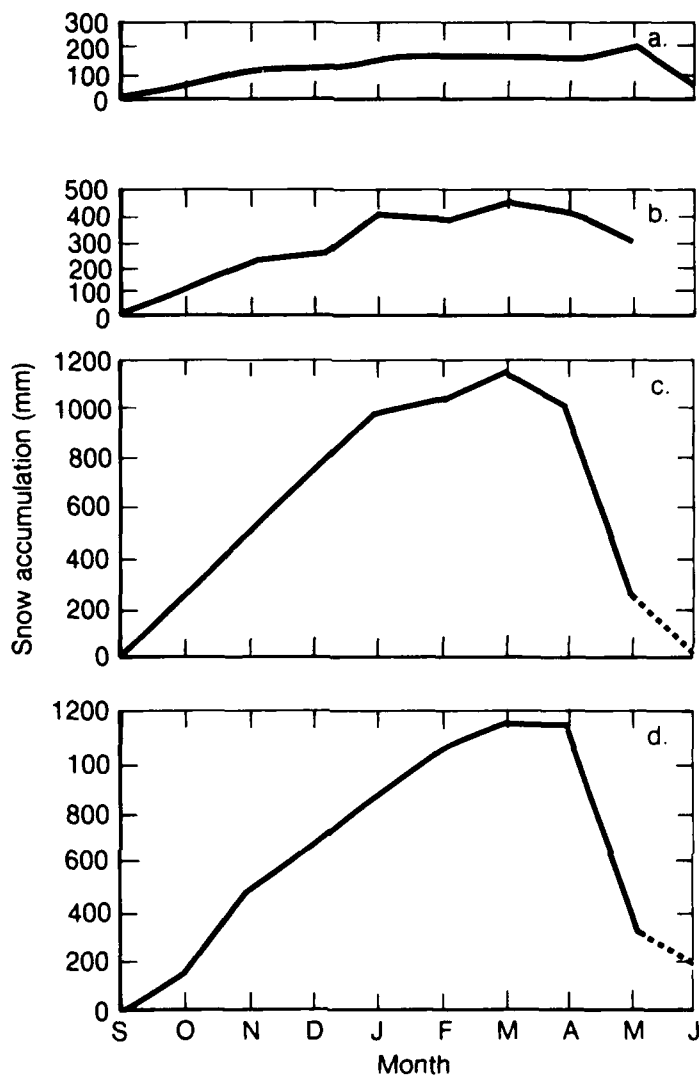
Fig. 2—Monthly precipitation at Greenland stations by latitude

Table 2

NORMALIZED MONTHLY SNOW ACCUMULATION: GREENLAND
(In percent)

Location	Month											
	S	O	N	D	J	F	M	A	M	J	J	A
<i>a. West Coast:</i>												
Accumulated	15	28	38	44	49	54	58	63	69	75	88	101
Normalized -- 62°N & 66°N	26	48	65	76	85	93	100	50	0			
Normalized -- 70°N & 74°N	24	44	60	70	78	86	92	100	50	0		
Normalized -- 78°N & 82°N	22	41	55	64	71	78	84	91	100	50	0	
<i>b. Southeast Coast:</i>												
Accumulated	12	25	36	43	50	60	67	74	80	87	93	101
Normalized -- 62°N & 66°N	18	37	54	64	75	90	100	50	0			
<i>c. East Coast (Southern):</i>												
Accumulated	12	25	35	50	57	64	69	74	77	83	92	100
Normalized -- 70°N	16	34	49	68	77	87	93	100	50	0		
<i>d. East Coast (Northern):</i>												
Accumulated	7	14	29	44	59	70	78	81	84	87	92	102
Normalized -- 74°N	9	17	36	54	73	86	96	100	50	0		
Normalized -- 78°N & 82°N	8	17	35	52	70	83	92	96	100	50	0	

elevation at 40°W longitude. Stations 1 through 5 typified the west, where precipitation peaks in late summer and fall; stations 6, 7, and 8 typified the southeast, where precipitation peaks in October and February; and stations 9 through 12 typified the east, where precipitation peaks in winter (Table 2 and Fig. 4). In the east, separate curves were used at 70°N and 74°N from September to April, and a common curve was used from April to June, the month of zero snow accumulation (Fig. 4). These curves were then used directly to compute the monthly snow depths at the 34 grid points across Greenland's ice cap from the mean annual accumulation curves (Fig. 1). No observed monthly snow-depth data were available for the ice cap.



SOURCE: References 2, 10, 13.

Station	Location	Elevation (m)	Years of Record
a. Ice Station A	82°-86° N, 113°-176° W		1
b. Point Barrow, Alaska	71° 23' N, 156° 17' W	4	3-6
c. Turukhansk, USSR	65° 47' N, 87° 57' E	45	21
d. Markovo, USSR	64° 41' N, 170° 25' E	20	16

Fig. 3—Mean monthly snow accumulation at various stations

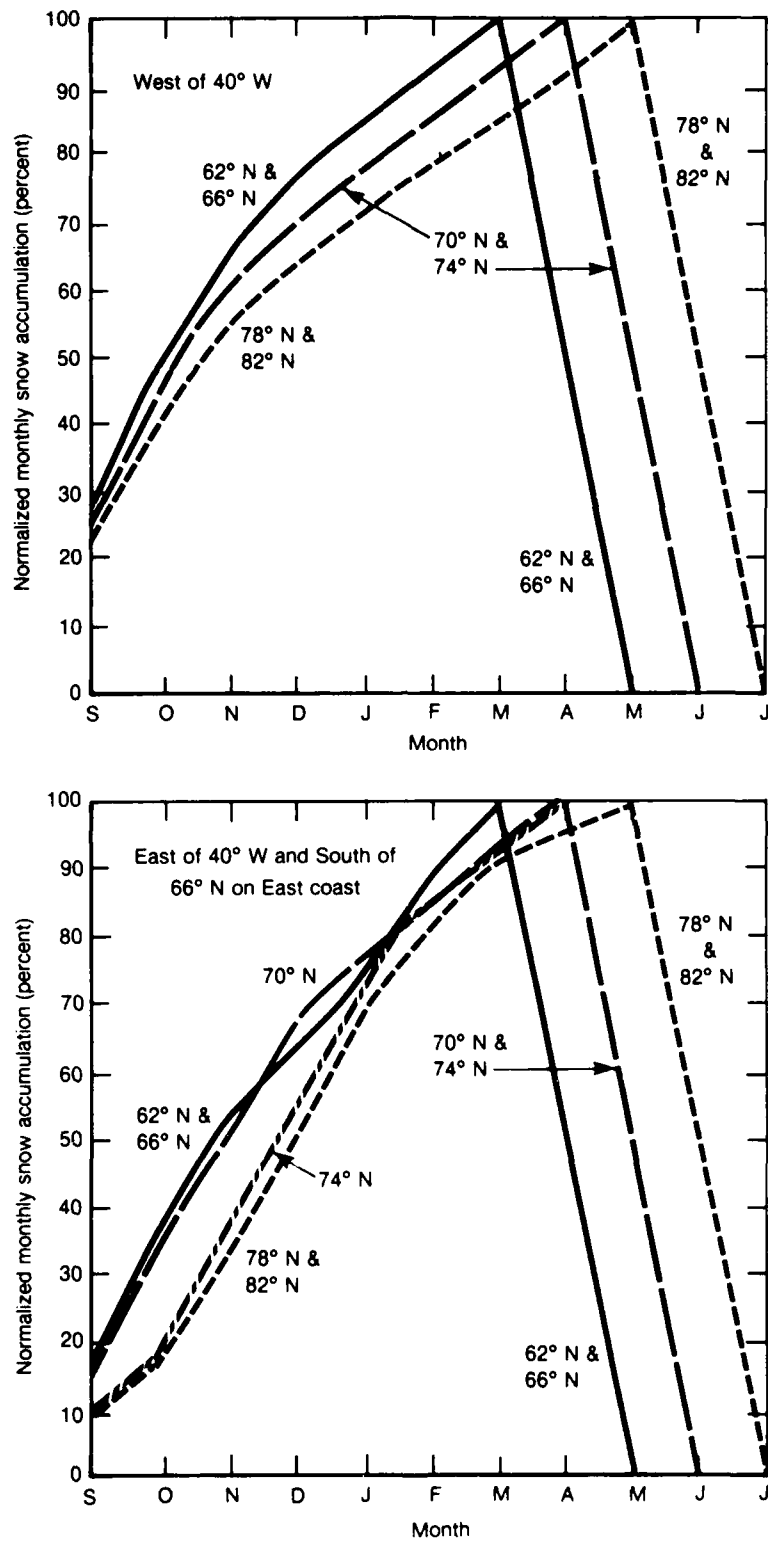


Fig. 4—Normalized monthly snow accumulation in Greenland
(Percent)

The snow accumulation values obtained were in millimeters of equivalent water depth and had to be converted to millimeters of snow. To determine the conversion factor, snow-cover densities from 27 stations in North America and Greenland prepared by Bilello [14] were used. Densities ranged from 0.199 g cm^{-3} at Fairbanks, Alaska, to 0.363 g cm^{-3} at Isachsen, Northwest Territory, with an arithmetic average of 0.282 and a median of 0.279 g cm^{-3} for the 27 stations. With water at 1.0 g cm^{-3} , this indicates a rough conversion factor for accumulated snow of 3 millimeters of snow to 1 millimeter of water. Fresh fallen snow, according to Huschke [15] usually has a much lower density of 0.07 to 0.15 g cm^{-3} , for a ratio of about 10:1.

ARCTIC BASIN

The rest of the Arctic, like Greenland, is data-sparse. It covers the grid points north of 70°N in the simulations. Professor Untersteiner at the University of Washington in conversations and in Ref. 13 and Vowinckel and Orvig in Ref. 16 have indicated that the annual precipitation over the polar ocean is meager. For example, Vowinckel and Orvig state that the probable average annual water equivalent snow accumulation over the central polar ocean is about 135 mm. Untersteiner [13] states that an accumulation of 210 mm was recorded for Ice Station A (between 80°N and 85°N at about 160°W) for the period from September 1957 to May 1958 (Table 3 and Fig. 5). Precipitation is mainly in the form of snow, with its maximum in autumn and late spring and its minimum in winter. May is the month of maximum accumulation.

Table 3

DRIFT STATION SNOW DEPTHS: 1957-1958 (IGY)

Date	U.S. Station "A"				USSR "North Pole 6"				USSR "North Pole 7"			
	Approx. Lat.	Approx. Long.	Depth* (mm)	% of Annual	Approx. Lat.	Approx. Long.	Depth (mm)	% of Annual	Approx. Lat.	Approx. Long.	Depth (mm)	% of Annual
July 1957	83.0 N	166.0 W	0	0	78.1 N	158.2 E	40	0	84.5 N	169.8 E	40	3 (1-91)
Aug. 1957	84.5 N	170.0 W	0	0	77.4 N	161.0 E	210	28	85.9 N	178.5 E	20	4 (2)
Sep. 1957	85.5 N	170.0 W	20	10	77.3 N	164.0 E	330	45	87.0 N	166.4 E	60	10
Oct. 1957	85.0 N	174.0 W	120	57	77.1 N	161.9 E	550	74	86.8 N	166.7 E	300	67
Nov. 1957	84.3 N	165.0 W	110	52	77.6 N	156.9 E	550	74	86.1 N	173.4 W	260	56
Dec. 1957	84.0 N	160.0 W	130	62	78.3 N	152.7 E	560	76	-	-	-	-
Jan. 1958	83.7 N	157.0 W	150	71	79.0 N	153.1 E	620	84	85.7 N	161.5 W	180	34
Feb. 1958	83.9 N	152.0 W	150	71	79.7 N	153.1 E	730 ^b	99	85.9 N	155.8 W	310 ^b	63
Mar. 1958	84.0 N	151.0 W	160	76	80.4 N	151.9 E	720	97	86.1 N	152.1 W	320	71
Apr. 1958	79.0 N	161.0 W	130	91	81.1 N	149.0 E	740	100	86.5 N	149.2 W	400	39
May. 1958	84.0 N	145.0 W	210	100	81.3 N	147.2 E	750	-6	86.4 N	147.8 W	430	100
June 1958	84.0 N	142.0 W	50	-76	82.3 N	141.7 E	440	-45	86.8 N	139.8 W	50	-88

Source: Reference 13.

*Total depth of new snow per month.

^bApproximate value.

Most of the precipitation in the Arctic was assumed to be of cyclonic origin [16]. Areas affected by individual storms, however, are not very large, and the active life of the surface cyclone is usually short. An annual storm-track map (Fig. 6) was used as a basis for extending local coastal snow-depth data for North America and the Soviet Union toward the pole. A limit on this poleward extension was made with accumulation measurements taken by observers aboard the U.S. Drifting Station A and the USSR drift stations North Pole 6 and North Pole 7 during the International Geophysical Year of 1957-58 [13] and from conversations with Prof. Untersteiner. This combination lent realism to the character of the isopleths. However, the lack of real data makes

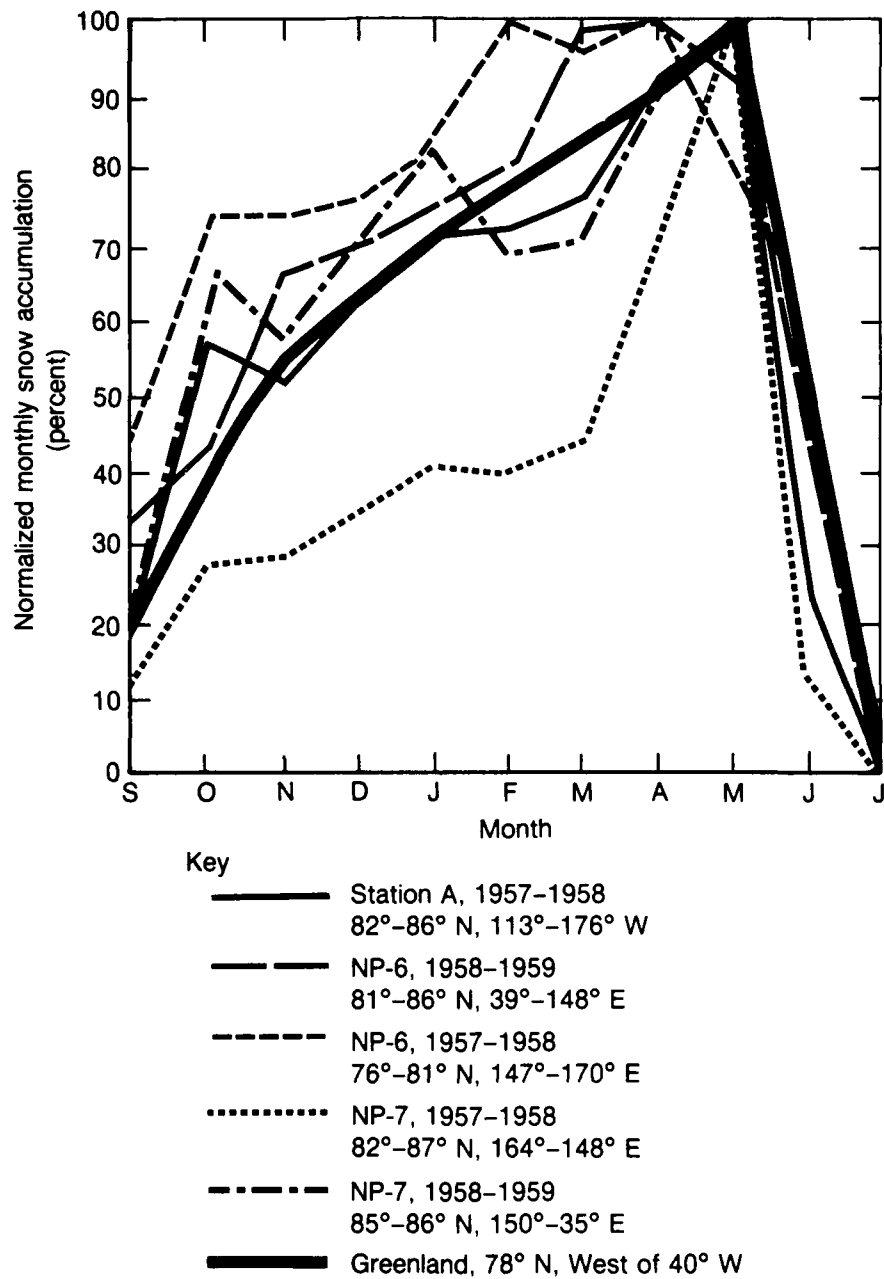


Fig. 5—Normalized monthly snow accumulation at Arctic drift stations
(Percent)

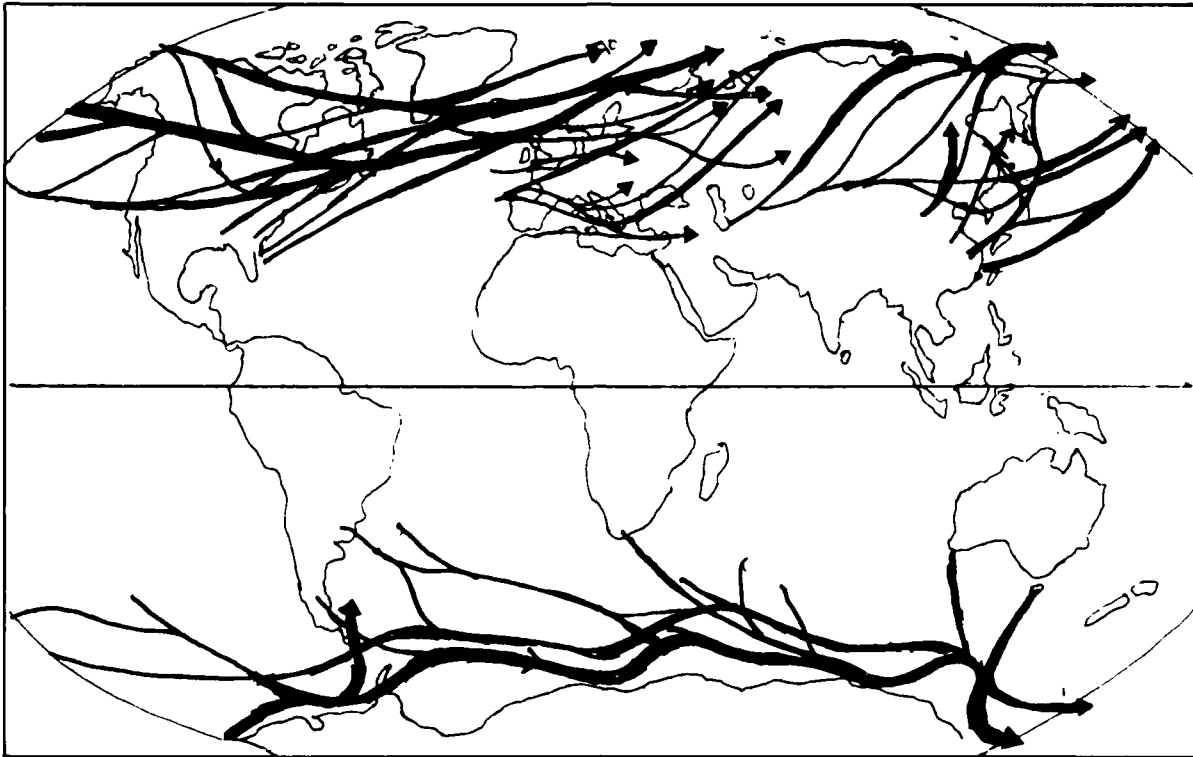
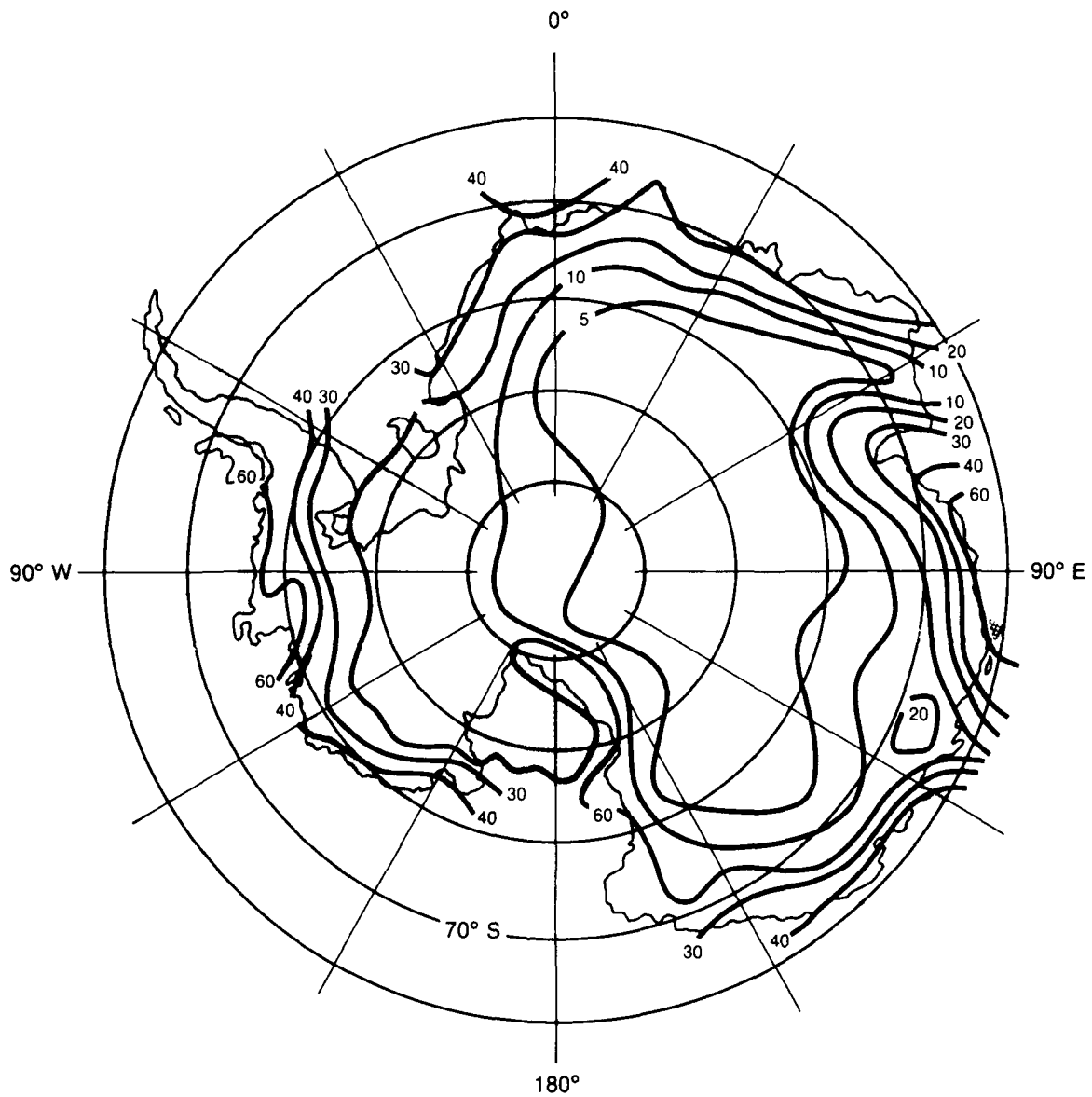


Fig. 6—Annual storm tracks, after Bartholomew [17]

the mean accumulation amounts at certain grid points over the Arctic ice cap questionable.

ANTARCTICA

Snow accumulation data for the Antarctic continent were available only as an average annual accumulation in g cm^{-2} ; see Fig. 7, which was taken from Schwerdtfeger [18]. Also, Schwerdtfeger emphatically stated that this accumulation results not only from solid precipitation due to the synoptic process but from evaporation, deposition (hoarfrost), and the effects of snow drift as well. In the inland plateau region, a major portion of the snow and ice is *not* brought about by precipitation.



SOURCE: Schwerdtfeger [18].

Fig. 7—Average annual snow accumulation over Antarctica
(g cm^{-2})

For example, Schwerdtfeger states that in 1967 and 1968, respectively, there were 40 and 62 days with observed snowfall (never more than "traces"), but there were 317 and 314 days with ice crystals floating in the air. For the coastal regions and the lower, steeper parts of the glacial slopes, the relation between precipitation and accumulation is much more uncertain because of the direct influence of cyclonic activity. It can vary from place to place due to wind, local terrain features, and observed surface characteristics, including temperatures above the freezing point. Therefore, stratigraphic (core-type) measurements at many spots surrounding permanent stations and during traverses have been the main source of information. According to Schwerdtfeger, the regional distribution of average annual net accumulation of snow is relatively well established.

The strong temperature contrast in the subpolar belt between the ice cap and the open ocean leads to the formation of cyclonic storms, which are the major source of snowfall; note Fig. 6. The coastal stations generally receive snow throughout the year [19]. They report late summer and autumn maxima, but a large portion of the precipitation can occur during the winter months. Although the storms are strongest in the subpolar belt, daily weather maps show that they do move far inland [18] and so are instrumental in the meridional exchange of air masses and transport of moisture from the oceanic to the continental regions. Thus, although most of the snow falls within a few hundred kilometers of the coast line [20], the downward transport of the atmospheric moisture brought in by the storm systems leads to the formation of ice particles and the deposition of hoarfrost that makes up a major portion of the accumulation inland [18]. In a rough sense, therefore, the inland and coastal accumulations of snow are related. We thus decided to use mean monthly snowfall amounts at the four coastal stations with the most complete records to prorate the average annual accumulation (Table 4).

The monthly mean snowfall at the coastal stations was converted to a percentage of the annual snowfall and then averaged by month for the four stations. December and January are the summer months in

Table 4
MONTHLY MEAN SNOWFALL AMOUNTS, ANTARCTICA
(In millimeters)

Station	Season ¹ and Month												Ann.	Years	
	1	2		3				4		1					
	J	F	M	A	M	J	J	A	S	O	N	D			
1. Ellsworth (50°W)	mm: %:	64 8	38 5	64 8	140 17	48 6	61 8	51 6	51 6	69 9	99 12	119 15	51 6	803 100	4-5
2. Hallett (180°)	mm: %:	201 11	251 13	389 20	145 8	201 11	104 6	226 12	135 7	84 4	81 4	18 1	10 1	1915 100	7-8
3. Little America (170°W)	mm: %:	104 4	338 13	414 16	198 8	272 11	213 8	168 7	122 5	234 9	211 8	117 5	241 10	2548 100	2-3
4. Wilkes (100°E)	mm: %:	137 5	53 2	427 14	277 9	343 11	297 10	325 11	211 7	386 13	292 9	234 7	79 3	3043 100	6-7
Average	%:	7	8	15	11	10	8	9	6	9	8	7	5		
Accumulation	%:	7	15	30	41	51	59	68	74	83	91	98	100	100	

Source: Reference 19.

¹ 1 = summer; 2 = fall; 3 = winter; 4 = spring.

Antarctica, but snowfall observations suggest that the annual accumulation begins as early as January. It increases steadily, reaching a maximum in November, and then decreases to zero by the following January (Fig. 8). With this methodology, 68 percent of the average annual accumulation was collected by the end of July (mid-winter) and 100 percent by the end of November. This would not hold true inland over the plateau, which lies generally above 2000 m. It probably does apply in the coastal areas, where liquid precipitation is occasionally found, and the small amount of snowfall indicated for December (Table 4) does not accumulate because of surface temperatures occasionally above freezing.

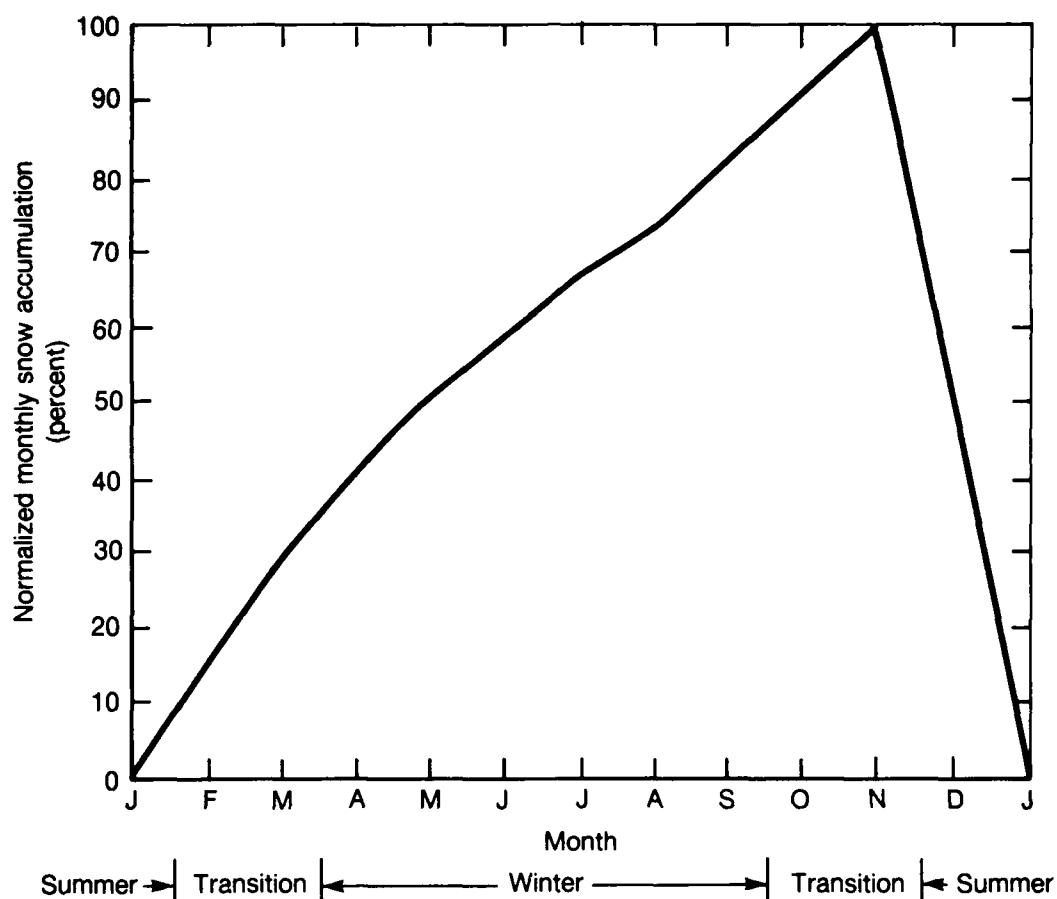


Fig. 8—Monthly snow accumulation over Antarctica
(Percent of annual)

After January, as ice begins to reform around the continent, the area covered by new snow increases. Ice limits for each month were used as the "zero-accumulation" line around the continent. Isopleths were drawn between the zero-accumulation line and known snow depths inland for determining grid-point values over this new ice. In the middle of the continent, about 150 mm of snow and rime accumulate annually throughout the entire plateau. No effort was made to scale down this area toward the central plateau.

To convert the average annual accumulation in g cm^{-2} to millimeters of snow, the basic density value of 1 g cm^{-3} for water was used. One year of data from Little America gave a snow density of 0.35, so the rule of 3 millimeters of snow for 1 millimeter of water, used in the Arctic, was also applied to the Antarctic.

CHINA

China, with grid points from 30°N to 46°N and from 75°E to 115°E in the RAND model, can be divided into three areas for the development of a snow-depth climatology. They are Tibet in the southwest, Sinkiang in the northwest, and the North-Central portion, where the mountains slope gradually eastward to the coastal plain.

During the snow season, or the period of the northeast monsoon from November to March, China is under the influence of the Siberian High [11]. By January this High becomes nearly stationary over Mongolia and is quite strong, with a central pressure greater than 1030 mb. The northeast monsoon is so called because it was originally studied over India, where the winter season winds originating in the Siberian High come from the northeast. Over much of China, the monsoon flow is from the north or northwest [21]. The Siberian High is the source of dry, stable, continental air that spreads over China and all of Southeast Asia.

The only moisture available for snow at this time comes from an occasional cyclonic storm that can bring in maritime air from the east or southeast. Most cyclonic storms, however, are deflected by the enormous mountain ranges that bound China to the west and southwest. Storms from the Mediterranean area are deflected southeastward by the mountains of Turkey and Iran well to the west and by the Himalayas in the south. Storms from Western Europe are deflected northeastward by the Pamir and Tien Shan ranges as well as by the nearly stationary Siberian High. In general, the total accumulation is less than 75 mm in the valleys where the snow is regularly measured during the period of the northeast monsoon. The exception seems to be through northern Sinkiang, where fronts occasionally extend southward from the more

active cyclonic storm systems moving across Siberia. These storms leave up to 180 mm of accumulated snow in an average winter season. In sum, throughout China, except on the higher mountain slopes and peaks, measured snow amounts are small during the snow season.

Since mean-monthly snow-accumulation data were not available for China, a simple methodology was devised to estimate any possible accumulation. It was based on the mean-monthly precipitation (water equivalent, in millimeters) and "mean-daily maximum" temperature ($^{\circ}\text{C}$) each month, published in an Atlas of Chinese Climatology [3]. In the areas where mean-daily maximum temperatures averaged below 0°C during the month, precipitation was assumed to be the water equivalent of snow. As discussed previously [14], "old" or accumulated snow has a density of approximately 0.3; therefore, the precipitation amounts were multiplied by three (except where noted) to give the snow depth. These amounts were then accumulated during the month when temperatures remained around 0°C or below. Any temperature below about 2°C or 3°C was assumed to give a potential for snow. It was also assumed that all temperatures were measured in a thermoscreen about 1.5 meters above the ground. At stations where the temperatures averaged well below 0°C for the month, snow depth developed from the water-equivalent precipitation was adjusted empirically. These precipitation data were multiplied by as much as six or even eight, since the snowfall would not compact fast and would remain less dense or more fluffy. Also, a careful interpolation was made between recording stations to determine the final grid-point value. This methodology gave snow depths that were, in general, compatible with the surrounding data from the Corps of Engineers study [2].

Tibet

Tibet, located in southwest China, with RAND grid points from 30°N to 38°N and 80°E to 100°E , has a mean elevation of 4000 meters, with many snow-covered peaks and snow fields extending to 6000 meters or more. Across Tibet, data on the mean number of days with snow cover are very sparse, and all the stations evaluated are at the lower valley levels where the people live. For the analyses, there were 12 grid

points on the RAND 4° latitude by 5° longitude grid and seven weather reporting stations (all below 3700 meters) from the Atlas of Chinese Climatology [3]; see Table 5a. The precipitation and temperature values in Table 5b show that any possible monthly snow accumulations at Tibet's weather reporting stations are 25 mm or less. This is true even though the precipitation total at Station A, for example, was multiplied by six because of the very low average daily maximum temperature in December and January. Therefore, since most of what falls is quickly evaporated in the dry air or blown into crevasses and low places by the almost constant wind, "no" snow accumulation was shown at the grid points from November through March across Tibet (see the appendix). It must be remembered, however, that snow falls year around on the higher peaks, which are usually well above the freezing level.

Sinkiang

Sinkiang in northwest China, with grid points from 30°N to 46°N and 75°E to 95°E , is surrounded by mountains, including the Altin Tagh in the south, the Pamirs and Tien Shan in the west, and the Altai range in the northeast. These ranges encompass the Dzungaria Basin in the northern portion and the Tarim Basin and the Takla Makan Desert in the southern portion of Sinkiang. The reporting stations are all below 1500 meters; see Table 6a. For the analysis, there were 11 grid points on the RAND 4° latitude by 5° longitude grid and nine reporting stations from the Atlas of Chinese Climatology [3] to use for the interpolations; see Table 6c.

Most of the snow cover is thin at the reporting points during the snow season from November to March. However, persistent below-freezing temperature within the dry continental air mass, as shown at Stations A and B in Table 6b, causes the snow from an occasional weather system to remain on the ground. The grid-point tabulations in the appendix reflect the influence of the weather systems that move across northern Sinkiang and the persistent low temperatures. Most locations in the higher mountains of west-central Sinkiang and the Dzungaria Basin in the north report snow cover continuously from November to March, for an average of 115-150 days per year. Resulting snow depths are 300-600 mm

Table 5

STATION SUMMARY FOR TIBET AND ENVIRONS

a. Station Locations

Station	Lat.	Long.	Elev. (m)
A. Huanghoyen (Mado) [Tsinghai]	34°57' N	98°08' E	4221
B. Katmandu [Nepal]	27°42' N	85°22' E	1336
C. Leh [Kashmir]	34°09' N	77°34' E	3514
D. Lhasa [Tibet]	29°42' N	91°08' E	3659
E. Tulanssu [Tsinghai]	37°01' N	98°46' E	2985
F. Yushu [Tsinghai]	33°06' N	96°45' E	3704
G. Ch'iemu (Cherchen) [Sinkiang]	38°08' N	85°32' E	966

b. Precipitation and Temperature

Sta.	November			December			January			February			March		
	P ^a	S ^b	T ^c	P	S	T	P	S	T	P	S	T	P	S	T
A.	3	8	-1	5	30	-7	5	30	-8	5	15	-4	8	15	1
B.	5		23	8		19	25		18	23		20	28		24
C.	< 1		6	5	15	3	10	3	0	8	23	2	8		7
D.	10		13	< 1		9	< 1		8	5		9	13		12
E.	3		6	0.3	0.8	3	< 1	4	0	3	8	2	5		7
F.	3		8	5	15	2	8		5	3		8	8	15	1
G.	3		8	< 1	4	2	< 1	4	0	< 1		7	0		16

^aPrecipitation, mean monthly water equivalent (millimeters).

^bSnow depth [precipitation times a multiple; see text] (millimeters).

^cTemperature, mean daily maximum (°C).

c. Stations Closest to Affected Grid Points (Appendix)

Lat.	Longitude				
	80°E	85°E	90°E	95°E	100°E
38°N			G	B	E
24°N	C	C	F	F	A
20°N	B	B	D	D	

Source: References 3, 22.

Table 6
STATION SUMMARY FOR SINKIANG

a. Station Locations

Station	Lat.	Long.	Elev. (m.)
A. Zaysan (U.S.S.R.)	47°28' N	84°55' E	693
B. Qitai (Ch'i-t'ai)	44°01' N	89°34' E	794
C. Ining (Kuldja)	43°57' N	81°20' E	564
D. Kuqar (K'u-ch'ei)	41°45' N	83°04' E	1100
E. Yenchi (Karashahr)	42°03' N	86°34' E	1038
F. Turfan	42°58' N	89°14' E	35
G. Tun-huang	40°08' N	94°47' E	1139
H. Kashgar (Ko-shih)	39°31' N	75°45' E	1410
I. Khotan (Ho-tien)	37°07' N	79°55' E	1387

b. Precipitation and Temperature

Sta.	November			December			January			February			March		
	P ^a	S ^b	T ^c	P	S	T	P	S	T	P	S	T	P	S	T
A.	18	53	-8	13	91	-15	8	114	-14	8	137	-12	10	168	-2
B.	15		1	10	30	-7	5	46	-11	10	76	-6			2
C.	38		3	23	69	-5	8	91	-4			2			7
D.	8		7	3	8	-3	< 1	11	-3			3			13
E.	5		7	3	8	-1	15	46	-3			4			13
F.	< 1		9	3	8	0	3	8	-4			6			17
G.	< 1		9	3	8	1	< 1		1			6			14
H.	5		12	8		3	15		1			6			13
I.	< 1		10	< 1		4	< 1		1			6			16

^aPrecipitation, mean monthly water equivalent (millimeters).

^bSnow depth [precipitation times a multiple; see text] (millimeters).

^cTemperature, mean daily maximum (°C).

c. Stations Closest to Affected Grid Points (Appendix)

Lat.	Longitude				
	75°E	80°E	85°E	90°E	95°E
46°N		C	A	B	
42°N	C	D	E	F	G
38°N	H	I	D, E		

Source: References 3, 22.

in these areas, and up to 150 mm in parts of the Tarin Basin in the south. There is an increase in snow depth north of 42°N between 75°E and 95°E .

North-Central China

North-Central China lies south of Mongolia and covers 10 grid points in the RAND model and 12 weather reporting stations from 34°N to 42°N and from 100°E to 115°E ; see Table 7a and 7c. The area slopes gradually eastward to the coastal plains and is drained by the extensive Huang Ho and Yangtze river systems, which flow eastward into the Yellow Sea. These major rivers are fed by an enormous amount of tropical rain during the wet summer monsoon from May to September, when the surface flow is from the southeast [21]. During the winter monsoon from November to March, the surface air flow is from the northeast over North-Central China, and the weather is dry, cold, and relatively clear; see Table 7b.

There is very little snow over North-Central China during the winter monsoon. As in the case of Sinkiang, migratory weather systems from the west are deflected and degraded by the enormous mountain ranges to the west and north, by the great Gobi Desert, and by the semi-permanent Siberian High over Mongolia [11]. This is the dry season. The scanty precipitation, which often falls as snow, is light and infrequent. In the southeast portion of this area, less than 25 mm of precipitation (water equivalent) is reported at most stations from November to March. The total snow depth decreases inland, where the northern plains are the driest region of North-Central China. In general, there is snow cover inland on about half of the days in the worst months. Snow does not often remain on the ground in the coastal locations south of 37°N or in the sheltered valleys inland. At these locations there are only one or two days with snow cover during the worst months. In the north, the temperatures remain well below 0°C during December, January, and February, but it is much warmer in the south. Therefore, for the interpolations, when considering both precipitation and temperature, snow depths at the grid points along 42°N , as shown in the appendix, reflect the four station values, whereas zero accumulation is shown at the grid points along 34°N . See Table 7b and 7c.

Table 7
STATION SUMMARY FOR NORTH CENTRAL CHINA

a. Station Locations

Station	Lat.	Long.	Elev. m.
A. Chiuchuan	39°50' N	98°15' E	1543
B. Huhohat'e (Kueisui)	40°49' N	111°41' E	1062
C. Tolun (Dolon Nor)	42°15' N	116°15' E	124
D. Changchiak'ou (Kaigan)	40°50' N	114°56' E	760
E. Chungning (Zhongning)	37°29' N	105°40' E	1186
F. Yülin	38°14' N	109°42' E	1956
G. Suite	34°25' N	109°57' E	2074
H. Shinchiahuang (Shihmen)	38°04' N	114°26' E	82
I. Wutu	34°23' N	104°41' E	1090
J. Anyang	36°07' N	114°22' E	76
K. Pohsien	33°53' N	115°47' E	37
L. Yinch'uan	38°29' N	106°13' E	1113

b. Precipitation and Temperature

Sta.	November			December			January			February			March		
	P ^a	S ^b	T ^c	P	S	T	P	S	T	P	S	T	P	S	T
A.	3		6	3	8	-1	< 1	4	0	3	8	3	5		10
B.	8		4	10	30	-2	5	46	-4	8	63	-1	5		8
C.	8	23	1	5	15	-10	5	33	-12	3	38	-7	8	23	2
D.	5	15	1	3	15	-10	3	30	-12	5	38	-7	5	15	2
E.	3		6	< 1	3	-1	3	11	-2	3		4	5		11
F.	13		8	3	8	1	3	8	0	3		4	8		11
G.	5		8	15		1	8	15	0	8		4	10		11
H.	15		12	3		7	3		3	5		6	5		15
I.	8		14	< 1		9	3		8	5		11	10		17
J.	30		14	13		9	5		8	20		12	28		17
K.	51		> 0	36		> 0	33		> 0	25		> 0	15		> 0
L.	8		6	> 1	4	-	> 1	4	-2	5		4	5		11

^aPrecipitation, mean monthly water equivalent (millimeters).

^bSnow depth [precipitation times a multiple; see text] (millimeters).

^cTemperature, mean daily maximum (°C).

Table 7 (Continued)

c. Stations Closest to Affected Grid Points (Appendix)

Lat.	Longitude			
	100°E	105°E	110°E	115°E
42°N	A	A,B	B	C,D
38°N		E,L	F,G	H
34°N		I	J	J,K

Source: References 3, 22

42°N, as shown in the appendix, reflect the four station values, whereas zero accumulation is shown at the grid points along 34°N. See Table 7b and 7c.

III. CONCLUSION

The data presented here were assembled and processed for a particular purpose: to support the numerical general circulation model used in the RAND climate dynamics project. They served that purpose but were never separately documented. The data base remained on file, however, and in the years since the ending of the climate dynamics project, it has been found to be of use to a number of researchers. Although other studies of snow depth and extent have since been made and published elsewhere, the RAND data base is so comprehensive that it remains a valuable research resource. For that reason, it was decided to document it at this time to make it more readily available and understandable to anyone having need for it.

The tabulated snow-accumulation values shown in the appendix are available on tape from the Data Facility within the RAND Computer Information Systems Department as Data Base No. 469. The tabulations for the RAND grid have also been interpolated to a 5° by 5° grid, and a tape of these interpolated values, identified as Data Base No. 366, is also available from the Data Facility.

Some more recent studies of snow cover by other agencies may be found in Refs. 30 through 35. These reports present different types of snow data and do not supplant the data base given here: they represent useful supplement to it.

Appendix

GLOBAL GRID-POINT TABULATIONS

Tables A.1 through A.12 are computer-generated tabulations of mean snow accumulation in millimeters for each point of the 4° latitude by 5° longitude grid for each of the 12 months as of the last day of each month. The value "0" is shown for grid points at which no snow is reported or for which no data could be generated, and "1" is shown for grid points at which a very small accumulation (a "trace") is reported. The values for the poles are indicated at each of the longitudes, although each pole is, in fact, but a single grid point.

An attempt was made to produce contour maps of snow accumulation for the mid-season months, but the severe crowding and fine detail of contours associated with the geography of certain areas precluded the construction of reproducible maps of manageable size. Hence, blank outline maps of the Northern and Southern Hemispheres in polar stereographic projection showing the location of each grid point are given as Figs. A.1 and A.2. These, in conjunction with Tables A.1 through A.12, will enable the reader to visualize the geographic distribution of snow accumulation.

Table A.1a

ACCUMULATION (22) -- JANUARY

	Longitude																	
Latitude	180	175W	170W	165W	160W	155W	150W	145W	140W	135W	130W	125W	120W	115W	110W	105W	100W	95W
90N	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145
86N	170	163	163	163	163	163	163	163	163	157	157	145	145	145	145	145	145	145
82N	254	234	216	208	198	198	180	180	180	178	178	152	145	145	127	127	127	127
78N	269	262	254	244	234	226	216	208	198	198	183	180	163	145	145	145	142	180
74N	198	216	198	208	208	208	183	198	191	185	180	145	254	127	145	180	330	269
70N	89	71	71	127	381	406	381	406	89	89	381	61	53	432	381	254	254	318
66N	381	203	127	508	508	483	508	508	533	559	533	533	508	432	406	330	305	330
62N	0	0	51	356	330	356	381	445	229	457	737	610	508	483	406	406	356	381
58N	0	0	0	0	0	279	0	0	0	0	406	508	457	483	356	406	432	483
54N	0	0	0	0	0	0	0	0	0	0	0	406	381	254	254	254	406	533
50N	0	0	0	0	0	0	0	0	0	0	0	0	203	178	127	152	254	508
46N	0	0	0	0	0	0	0	0	0	0	0	0	38	114	51	76	102	191
42N	0	0	0	0	0	0	0	0	0	0	0	0	51	127	76	25	38	76
38N	0	0	0	0	0	0	0	0	0	0	0	0	13	127	25	13	13	13
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	203	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
82S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
86S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A.1b

ACCUMULATION (mm) -- JANUARY

[illegible]

Table A.1c

ACCUMULATION (■) -- JANUARY

Latitude	Longitude																		
	0	5E	10E	15E	20E	25E	30E	35E	40E	45E	50E	55E	60E	65E	70E	75E	80E	85E	
90N	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	
86N	132	132	132	132	135	135	137	140	145	145	145	145	145	145	140	140	140	140	
82N	104	97	97	91	91	91	97	102	107	122	130	140	137	137	137	137	135	135	
78N	10	0	0	23	36	36	43	43	53	79	97	137	137	137	137	140	137	135	
74N	0	0	0	0	0	0	0	0	0	0	99	127	132	124	127	130	135	157	
70N	0	0	0	0	0	330	330	0	0	0	89	53	18	18	102	254	559	533	
66N	0	0	0	711	711	559	508	457	305	254	254	381	533	483	508	635	762	762	
62N	0	0	381	305	0	432	483	381	584	508	533	635	533	508	508	584	610	610	
58N	0	0	0	229	0	191	305	381	381	508	546	508	508	508	508	559	457	508	
54N	0	0	51	0	76	127	254	305	330	406	432	533	508	508	381	254	305	457	
50N	0	0	25	51	76	25	140	191	203	203	152	254	203	216	24	229	249	508	
46N	0	0	0	51	0	0	13	0	102	76	0	76	76	102	118	152	91	114	
42N	0	0	0	0	0	0	0	0	0	102	0	0	13	25	89	91	10	46	
38N	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
30S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
34S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
38S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
42S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
46S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
50S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
54S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
58S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
62S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
66S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
70S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
74S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
78S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
82S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
86S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
90S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Table A.1d

ACCUMULATION (■) -- JANUARY

[illegible]

[illegible]

Table A.2b

ACCUMULATION (mm) -- FEBRUARY

[illegible]

Table A.2c

ACCUMULATION (mm) -- FEBRUARY

Latitude	Longitude																		
	0	5E	10E	15E	20E	25E	30E	35E	40E	45E	50E	55E	60E	65E	70E	75E	80E	85E	
90N	157	157	157	157	157	157	157	157	157	157	157	157	157	157	157	157	157	157	
86N	157	157	157	157	160	160	163	165	168	168	168	157	157	157	157	155	152	152	
82N	122	117	117	109	109	109	117	119	127	142	155	155	152	152	150	150	150	150	
78N	0	0	0	25	43	43	51	51	64	94	117	152	152	152	152	150	150	150	
74N	0	0	0	0	0	0	0	0	0	0	117	13	150	140	140	142	155	173	
70N	0	0	0	0	0	381	660	0	0	0	104	64	20	20	102	152	610	1067	
66N	0	0	0	787	737	559	686	508	508	508	457	457	508	533	533	610	737	965	
62N	0	0	660	457	0	508	508	533	762	610	711	711	762	635	660	711	660	762	
58N	0	0	0	254	0	203	381	508	508	559	660	635	406	330	457	533	457	533	
54N	0	0	51	76	51	102	229	279	432	483	533	533	508	483	483	305	432	508	
50N	0	0	25	38	76	102	127	152	254	263	203	229	203	178	229	254	254	635	
46N	0	0	508	0	0	25	0	0	127	25	0	51	76	76	76	25	0	137	
42N	0	0	0	0	0	0	0	0	0	51	0	0	0	25	25	13	0	0	
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
30S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
34S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
38S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
42S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
46S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
50S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
54S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
58S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
62S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
66S	0	0	0	0	0	0	0	0	119	127	137	137	91	43	61	137	183	25	
70S	183	173	137	122	137	137	137	137	137	104	46	23	23	99	150	168	130	91	
74S	69	46	38	33	30	23	23	23	23	23	23	23	33	69	69	46	30	25	
78S	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	
82S	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	
86S	33	33	30	30	28	25	25	25	23	23	23	23	23	23	23	23	23	23	
90S	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	

Table A.2d

ACCUMULATION (22) -- FEBRUARY

[illegible]

	Longitude																	
Latitude	180	175W	170W	165W	160W	155W	150W	145W	140W	135W	130W	125W	120W	115W	110W	105W	100W	95W
90N	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
86N	203	193	193	193	193	193	193	193	193	188	188	170	170	170	170	170	170	170
82N	300	277	254	246	234	234	213	213	213	208	208	180	170	170	150	150	150	150
78N	320	310	297	284	274	267	254	246	234	218	213	193	170	170	170	170	170	20
74N	234	254	234	246	246	246	239	234	224	221	213	170	203	150	170	213	381	318
70N	107	86	86	150	432	432	483	107	107	107	533	64	64	254	254	279	330	406
66N	381	508	584	889	686	279	406	584	610	610	635	635	635	584	533	381	254	229
62N	0	25	127	279	279	254	229	381	279	254	330	508	356	457	533	432	406	508
58N	0	0	25	0	0	0	0	0	0	0	203	381	279	330	305	432	457	533
54N	0	0	0	0	0	0	0	0	0	0	0	254	178	127	254	152	381	660
50N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	102	25	127	254
46N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	25	18	18
42N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	13	13	13
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0														

Table A.3b

ACCUMULATION (mm) -- MARCH

[illegible]

Table A.3c

ACCUMULATION (mm) -- MARCH

[illegible]

[illegible]

[illegible]

[illegible]

Table A.4c

ACCUMULATION (11) -- APRIL

Latitude	Longitude																	
	0	5E	10E	15E	20E	25E	30E	35E	40E	45E	50E	55E	60E	65E	70E	75E	80E	85E
90N	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185
86N	183	183	183	183	185	185	188	191	196	196	185	185	185	185	183	180	178	178
82N	142	135	135	127	127	127	135	140	147	165	178	180	178	178	175	175	173	173
78N	13	0	0	30	48	48	58	58	74	109	135	178	178	178	178	175	173	173
74N	0	0	0	0	0	0	0	0	0	0	127	175	173	163	163	168	173	201
70N	0	0	0	0	0	203	279	0	0	0	114	69	23	23	25	127	254	406
66N	0	0	0	711	432	330	254	203	0	0	229	229	279	229	229	254	483	762
62N	0	0	203	279	0	76	25	76	178	64	76	127	127	76	191	432	305	457
58N	0	0	0	0	0	0	13	25	13	25	25	25	25	25	89	51	51	192
54N	0	0	0	0	0	0	0	0	0	13	13	25	25	25	102	13	51	38
50N	0	0	0	0	0	0	0	0	0	0	0	0	0	25	25	13	13	0
46N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66S	302	312	0	0	0	0	0	0	0	343	373	373	251	114	168	373	498	671
70S	498	467	373	333	373	373	373	373	373	284	124	64	64	269	406	457	353	251
74S	188	124	104	94	84	64	64	64	64	64	64	64	94	188	188	124	84	69
78S	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64
82S	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64
86S	94	89	84	84	79	74	74	69	64	64	64	64	64	64	64	64	64	64
90S	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84

Table A.4d

ACCUMULATION (■) -- APRIL

	Longitude																	
Latitude	90E	95E	100E	105E	110E	115E	120E	125E	130E	135E	140E	145E	150E	155E	160E	165E	170E	175E
90N	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185
86N	180	178	178	178	178	178	196	196	196	208	208	208	221	221	221	221	221	221
82N	163	140	140	127	140	140	173	208	231	297	358	394	414	437	391	391	368	345
78N	114	81	23	18	46	114	173	218	277	323	368	462	508	531	508	485	462	391
74N	178	178	178	152	127	185	173	218	173	218	277	345	391	414	331	381	345	277
70N	483	508	483	432	330	254	229	191	127	127	127	381	610	559	483	277	231	163
66N	889	711	610	533	457	381	305	254	127	178	127	254	381	457	686	838	813	660
62N	508	508	432	330	356	254	229	191	64	102	152	178	229	279	356	406	508	381
58N	127	76	38	13	127	330	102	76	89	102	203	51	51	0	0	0	0	0
54N	254	25	25	51	25	64	25	13	25	25	25	13	0	0	1016	0	0	0
50N	0	0	0	254	0	0	0	0	0	0	25	13	0	0	0	0	0	0
46N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66S	749	749	706	498	259	251	498	498	498	498	498	498	447	0	0	0	0	0
70S	218	208	198	188	218	208	124	109	104	124	178	251	333	310	284	290	251	188
74S	64	74	84	89	89	69	64	64	64	64	64	69	94	145	251	259	269	259
78S	64	64	64	64	64	64	64	64	64	64	64	64	64	94	157	193	251	251
82S	64	64	64	64	64	64	64	64	64	74	99	114	124	218	251	251	251	239
86S	64	64	64	64	64	64	64	64	64	64	64	64	64	94	124	124	188	229
90S	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84

[illegible]

Table A.5b

ACCUMULATION (mm) -- MAY

Latitude	Longitude																	
	90W	85W	80W	75W	70W	65W	60W	55W	50W	45W	40W	35W	30W	25W	20W	15W	10W	5W
90N	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203
86N	191	188	185	188	178	178	170	170	168	168	170	170	170	178	178	180	183	188
82N	160	152	145	140	127	127	114	114	737	686	635	737	940	127	127	132	140	140
78N	203	191	127	51	1397	1219	711	610	508	432	381	381	406	584	89	76	64	51
74N	432	457	406	229	102	76	25	533	813	521	292	305	457	508	483	43	64	0
70N	432	508	546	546	483	368	178	0	584	813	559	445	686	1168	64	0	0	0
66N	381	419	445	508	635	762	572	0	1	1	1	51	0	0	0	0	0	0
62N	279	279	305	356	432	508	0	0	1	0	0	0	0	0	0	0	0	0
58N	25	0	76	203	292	318	64	0	0	0	0	0	0	0	0	0	0	0
54N	0	0	0	127	76	102	127	0	0	0	0	0	0	0	0	0	0	0
50N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62S	0	0	0	0	0	0	0	102	102	89	89	102	119	127	140	145	152	152
66S	0	0	0	0	152	305	356	305	267	203	165	157	203	241	279	305	356	368
70S	457	457	495	572	648	584	495	432	368	305	241	241	292	348	419	495	597	610
74S	914	914	914	889	686	597	635	457	394	318	292	305	406	457	495	457	368	305
78S	406	381	368	368	368	368	343	343	318	305	305	318	356	348	305	229	152	102
82S	246	246	246	246	246	241	234	229	229	221	203	196	178	157	152	127	107	94
86S	170	170	170	178	170	165	165	165	165	157	152	152	140	132	127	119	119	114
90S	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102

Table A.5c

ACCUMULATION (mm) -- MAY

[illegible]

Table A.5d

ACCUMULATION (mm) -- MAY

[illegible]

Table A.6a

ACCUMULATION (mm) -- JUNE

[illegible]

	Longitude																	
Latitude	90W	85W	80W	75W	70W	65W	60W	55W	50W	45W	40W	35W	30W	25W	20W	15W	10W	5W
90N	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102
86N	94	94	91	94	89	89	84	84	84	84	84	84	84	89	89	89	91	94
82N	79	0	0	0	64	64	56	56	114	343	318	368	470	64	64	66	69	69
78N	102	0	0	0	699	610	356	305	254	216	191	191	203	292	43	38	43	25
74N	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	20	0	0
70N	0	0	C	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0
66N	0	0	C	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0
62N	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
58N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	C	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0	0	0</													

Table A.6c

ACCUMULATION (mm) -- JUNE

[illegible]

Table A.6d

ACCUMULATION (mm) -- JUNE

	Longitude																	
Latitude	90E	95E	100E	105E	110E	115E	120E	125E	130E	135E	140E	145E	150E	155E	160E	165E	170E	175E
90N	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102
86N	99	97	97	97	97	97	107	107	107	114	114	114	119	119	119	119	119	119
82N	89	76	76	69	76	76	94	114	127	165	196	216	229	241	216	216	203	191
78N	64	43	13	10	25	64	94	119	152	178	203	254	279	279	279	254	254	216
74N	0	0	0	0	0	102	94	94	94	119	152	216	216	229	216	208	191	152
70N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	152	127	89
66N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62S	282	358	358	358	165	127	104	89	89	74	46	30	0	0	0	0	0	0
66S	1077	1077	1016	719	373	358	719	719	719	719	719	719	645	538	411	254	150	89
70S	315	300	282	269	315	300	180	157	150	180	254	358	478	450	411	419	358	269
74S	89	104	119	127	127	97	89	89	89	89	89	97	135	211	358	373	386	373
78S	89	89	89	89	89	89	89	89	89	89	89	89	89	135	226	274	358	358
82S	89	89	89	89	89	89	89	89	89	104	142	165	180	315	358	358	358	343
86S	89	89	89	89	89	89	89	89	89	89	89	89	89	135	180	180	269	330
90S	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119

[illegible]

Table A.7b

ACCUMULATION (mm) -- JULY

Latitude	Longitude																	
	90W	85W	80W	75W	70W	65W	60W	55W	50W	45W	40W	35W	30W	25W	20W	15W	10W	5W
90N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
86N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
82N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58S	0	0	0	0	0	0	0	0	0	0	0	43	104	86	69	69	69	69
62S	0	0	0	0	0	0	104	137	137	119	119	137	165	173	191	198	208	208
66S	0	0	61	122	208	411	483	411	361	274	226	216	274	328	378	411	483	500
70S	620	620	673	775	879	792	673	584	500	411	328	328	396	475	569	671	808	828
74S	1240	1240	1240	1207	930	810	706	620	533	432	396	411	551	620	673	620	500	411
78S	551	513	500	500	500	500	465	462	432	411	411	432	483	475	411	310	208	137
82S	335	335	335	335	335	328	318	310	310	300	274	267	241	216	208	173	147	112
86S	234	234	234	241	234	224	224	224	224	216	208	208	191	183	173	165	165	155
90S	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
90S																		

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

	Longitude																	
Latitude	180	175W	170W	165W	160W	155W	150W	145W	140W	135W	130W	125W	120W	115W	110W	105W	100W	95W
90N	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
86N	53	51	51	51	51	51	51	51	51	48	48	43	43	43	43	43	43	43
82N	79	74	66	64	61	61	56	56	56	56	56	48	43	43	38	38	38	38
78N	84	81	79	76	74	71	66	64	61	61	56	56	51	43	43	43	0	0
74N	61	66	61	64	64	64	64	61	58	58	56	0	0	38	43	56	0	0
70N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66S	84	43	30	20	84	117	127	127	107	74	53	20	20	25	33	38	46	51
70S	295	254	254	254	335	505	442	462	485	462	485	505	579	693	737	757	757	757
74S	518	505	505	589	676	716	757	757	820	884	1011	1011	1011	970	1524	1524	1524	1524
78S	577	610	678	737	757	823	843	716	505	485	495	505	505	505	583	681	696	716
82S	488	462	432	411	401	378	368	358	348	335	335	348	358	378	378	401	411	411
86S	505	505	505	505	505	505	495	442	419	378	358	315	295	284	274	274	274	284
90S	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168

Table A.9b

ACCUMULATION (mm) -- SEPTEMBER

[illegible]

Table A.9c

ACCUMULATION (mm) -- SEPTEMBER

[illegible]

Table A.9d

ACCUMULATION (mm) -- SEPTEMBER

	Longitude																	
Latitude	90E	95E	100E	105E	110E	115E	120E	125E	130E	135E	140E	145E	150E	155E	160E	165E	170E	175E
90N	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
86N	43	43	43	43	43	43	48	48	48	51	51	51	53	53	53	53	53	53
82N	38	33	33	30	33	33	43	51	56	74	86	94	102	107	94	94	89	84
78N	28	20	0	0	0	0	43	53	66	79	66	112	122	130	122	117	112	94
74N	0	0	0	0	0	0	0	0	0	0	0	0	0	102	94	91	84	66
70N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62S	401	505	505	505	231	180	147	127	127	104	64	43	43	20	20	0	0	0
66S	1524	1524	1435	1011	526	505	1011	1011	1011	1011	1011	1011	902	757	577	358	211	127
70S	439	422	401	378	439	422	254	221	211	254	358	505	673	632	577	589	505	378
74S	127	147	168	180	180	137	127	127	127	127	127	137	191	295	505	523	546	526
78S	127	127	127	127	127	127	127	127	127	127	127	127	127	191	315	389	505	505
82S	127	127	127	127	127	127	127	127	127	147	201	231	254	442	505	505	505	505
86S	127	127	127	127	127	127	127	127	127	127	127	127	127	191	254	254	378	208
90S	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168

Table A.10a

ACCUMULATION (mm) -- OCTOBER

Latitude	Longitude																	
	180	175W	170W	165W	160W	155W	150W	145W	140W	135W	130W	125W	120W	115W	110W	105W	100W	95W
90N	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
86N	97	91	91	91	91	91	91	91	91	89	89	81	81	81	81	81	81	81
82N	142	132	122	117	112	112	102	102	102	99	249	86	81	81	71	71	71	71
78N	152	147	142	137	132	127	122	117	112	112	104	102	91	81	81	81	127	178
74N	112	122	112	117	117	117	114	112	107	104	102	81	51	71	81	102	203	254
70N	51	0	0	0	127	152	127	102	51	51	76	76	30	76	127	178	191	178
66N	76	13	0	51	76	102	140	152	254	254	229	140	64	102	89	102	114	127
62N	0	0	0	13	25	25	18	25	23	25	64	64	51	25	51	51	76	127
58N	0	0	0	0	0	0	0	0	0	0	0	5	15	23	25	20	51	127
54N	0	0	0	0	0	0	0	0	0	0	0	0	13	20	13	38	76	114
50N	0	0	0	0	0	0	0	0	0	0	0	0	0	8	13	13	13	25
46N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	5	5
42N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66S	91	46	36	23	91	127	137	137	114	800	56	23	23	33	43	53	64	74
70S	323	274	274	274	368	432	483	483	521	502	521	546	635	749	800	813	813	813
74S	559	559	559	635	737	775	826	826	889	965	1092	1092	1092	1054	1651	1651	1651	1651
78S	635	660	737	800	826	889	914	775	559	546	533	559	559	559	625	711	737	767
82S	533	508	470	445	432	406	406	381	381	369	369	381	381	406	406	432	445	445
86S	559	559	559	559	559	559	533	481	457	400	381	343	318	292	292	292	292	305
90S	183	183	183	183	183	183	183	183	183	183	183	183	183	183	183	208	183	183

[illegible]

[illegible]

Latitude	Longitude																
	90E	95E	100E	105E	110E	115E	120E	125E	130E	135E	140E	145E	150E	155E	160E	165E	170E
90N	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
86N	81	81	79	79	79	79	89	89	89	94	94	94	99	99	99	99	99
82N	74	64	64	56	64	64	79	94	104	135	163	178	188	198	178	178	168
78N	51	36	10	8	20	51	79	99	124	147	168	208	229	241	229	218	208
74N	25	25	51	76	102	84	79	79	79	99	124	157	178	188	178	173	157
70N	305	241	203	191	178	165	152	127	102	76	102	127	191	241	305	135	102
66N	254	229	198	191	178	165	140	127	102	102	76	102	102	114	152	216	241
62N	165	140	127	127	102	102	127	140	152	102	76	76	76	51	51	102	192
58N	102	51	76	76	76	152	178	203	152	102	51	0	0	0	51	0	0
54N	13	25	64	51	191	102	140	267	254	127	76	0	0	0	51	0	0
50N	0	0	0	25	76	13	51	229	254	25	10	0	0	0	0	0	0
46N	0	0	0	25	23	20	51	51	13	0	0	0	0	0	0	0	0
42N	0	0	0	0	28	13	38	0	0	0	0	0	0	0	0	0	0
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0	0	0												

Latitude	Longitude																	
	180	175W	170W	165W	160W	155W	150W	145W	140W	135W	130W	125W	120W	115W	110W	105W	100W	95W
90N	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112
86N	132	127	127	127	127	127	127	127	127	122	122	112	112	112	112	112	112	112
82N	196	183	168	160	155	155	140	140	140	137	137	119	112	112	99	99	99	99
78N	211	203	211	188	183	175	168	160	155	155	142	140	127	112	112	112	140	140
74N	155	168	155	160	160	160	157	155	147	145	140	112	127	99	112	140	140	208
70N	69	56	56	99	229	254	254	254	69	69	229	254	41	127	178	229	229	279
66N	76	25	0	203	279	305	305	279	381	381	330	305	254	254	254	229	229	229
62N	0	0	0	102	76	127	127	254	191	152	318	330	279	254	254	254	254	241
58N	0	0	0	0	0	13	0	0	0	0	51	229	318	178	254	279	279	254
54N	0	0	0	0	0	0	0	0	0	0	0	25	102	127	102	127	254	381
50N	0	0	0	0	0	0	0	0	0	0	0	0	25	51	76	76	127	178
46N	0	0	0	0	0	0	0	0	0	0	0	0	0	25	25	13	13	51
42N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	1	0	13
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0</													

Latitude	Longitude																	
	90W	85W	80W	75W	70W	65W	60W	55W	50W	45W	40W	35W	30W	25W	20W	15W	10W	5W
90N	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112
86N	104	104	102	104	97	97	94	94	91	91	58	58	58	64	64	64	64	66
82N	89	254	254	254	69	69	64	64	404	376	224	259	328	46	46	46	48	48
78N	112	356	330	25	767	671	391	335	279	239	132	132	142	203	30	28	23	0
74N	239	251	178	114	51	0	0	640	975	625	284	297	447	498	472	15	0	0
70N	239	203	254	254	254	203	0	0	701	975	549	437	671	1143	0	0	0	0
66N	279	305	356	432	419	483	318	0	660	676	1372	0	0	0	0	0	0	0
62N	229	229	254	229	0	254	0	0	0	1570	0	0	0	0	0	0	0	0
58N	254	279	279	254	229	254	0	0	0	0	0	0	0	0	0	0	0	0
54N	559	356	305	394	406	330	254	0	0	0	0	0	0	0	0	0	0	0
50N	229	254	229	279	254	165	0	0	0	0	0	0	0	0	0	0	0	0
46N	76	102	102	102	64	51	0	0	0	0	0	0	0	0	0	0	0	0
42N	13	25	38	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0															

[illegible]

[illegible]

	Longitude																	
Latitude	180	175W	170W	165W	160W	155W	150W	145W	140W	135W	130W	125W	120W	115W	110W	105W	100W	95W
90N	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132
86N	155	147	147	147	147	147	147	147	147	142	142	132	132	132	132	132	132	132
82N	229	211	196	188	178	178	163	163	163	160	160	137	132	132	114	114	114	114
78N	244	236	229	221	211	203	196	188	178	178	165	163	147	132	132	132	130	163
74N	178	196	178	188	188	188	183	178	170	168	163	132	152	114	132	163	254	244
70N	81	66	66	114	279	254	254	254	81	81	254	51	48	381	254	254	305	356
66N	203	25	25	356	381	406	406	406	406	406	508	508	356	305	305	330	254	229
62N	0	0	0	203	254	254	229	330	254	305	508	533	457	406	356	356	368	508
58N	0	0	0	0	0	51	0	0	0	0	305	381	381	356	305	381	457	508
54N	0	0	0	0	0	0	0	0	0	0	0	0	254	203	229	229	356	432
50N	0	0	0	0	0	0	0	0	0	0	0	0	152	152	127	127	203	254
46N	0	0	0	0	0	0	0	0	0	0	0	0	0	51	51	51	64	114
42N	0	0	0	0	0	0	0	0	0	0	0	0	0	51	76	25	25	25
38N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	13
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0														

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[illegible]

Table A.12d

ACCUMULATION (■) -- DECEMBER

	Longitude																	
Latitude	90E	95E	100E	105E	110E	115E	120E	125E	130E	135E	140E	145E	150E	155E	160E	165E	170E	175E
90N	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132
86N	127	124	124	124	124	124	137	137	137	147	147	147	155	155	155	155	155	155
82N	114	97	97	89	97	97	122	147	163	211	251	277	292	310	277	277	262	244
78N	81	56	15	13	33	81	122	155	196	229	259	325	358	371	358	340	325	277
74N	102	127	203	203	127	132	122	122	155	196	244	274	292	292	277	267	244	196
70N	762	610	495	457	406	368	305	254	127	76	127	279	406	432	406	196	163	114
66N	762	660	559	483	445	381	356	318	267	203	305	381	381	356	457	508	559	432
62N	610	559	483	432	406	406	368	330	305	229	305	356	406	356	229	356	635	508
58N	406	330	330	318	356	457	381	330	305	279	267	0	0	0	0	0	0	0
54N	254	152	152	254	254	203	229	406	559	508	483	0	0	0	711	0	0	0
50N	127	127	127	381	152	25	178	318	508	305	305	0	0	0	0	0	0	0
46N	30	76	51	25	51	23	0	76	76	102	0	0	0	0	0	0	0	0
42N	0	0	8	23	30	15	0	0	0	0	0	0	0	0	0	0	0	0
38N	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66S	914	914	864	610	318	305	610	610	610	610	610	610	546	457	348	216	127	76
70S	267	254	241	229	267	254	152	132	127	152	216	305	406	381	348	356	305	229
74S	76	89	102	107	107	81	76	76	76	76	76	81	114	178	305	318	330	318
78S	76	76	76	76	76	76	76	76	76	76	76	76	76	114	191	234	305	305
82S	76	76	76	76	76	76	76	76	76	89	119	140	152	267	305	305	305	292
86S	76	76	76	76	76	76	76	76	76	76	76	76	76	114	152	279	229	279
90S	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102

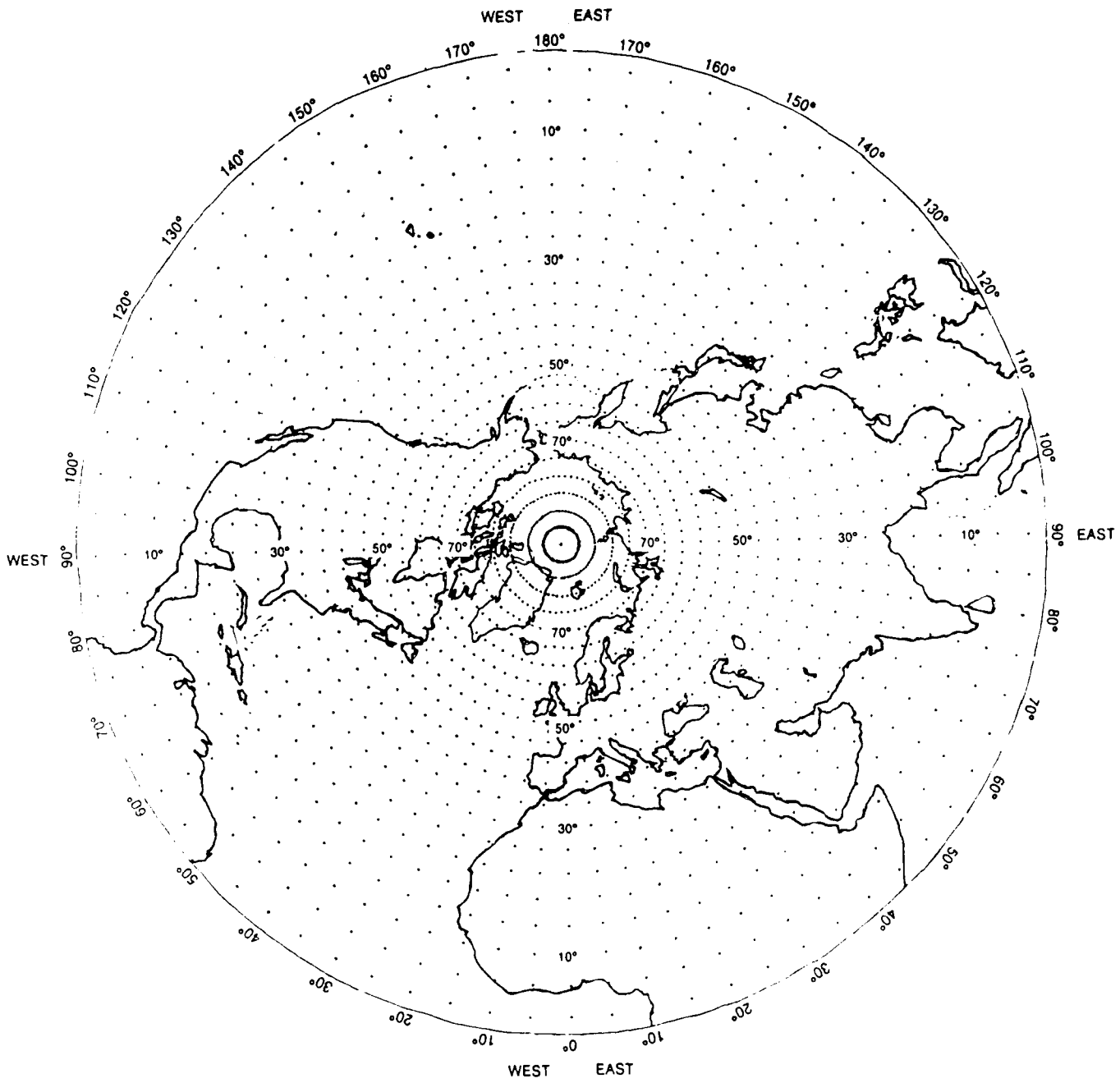


Fig. A.1—Map grid of Northern Hemisphere

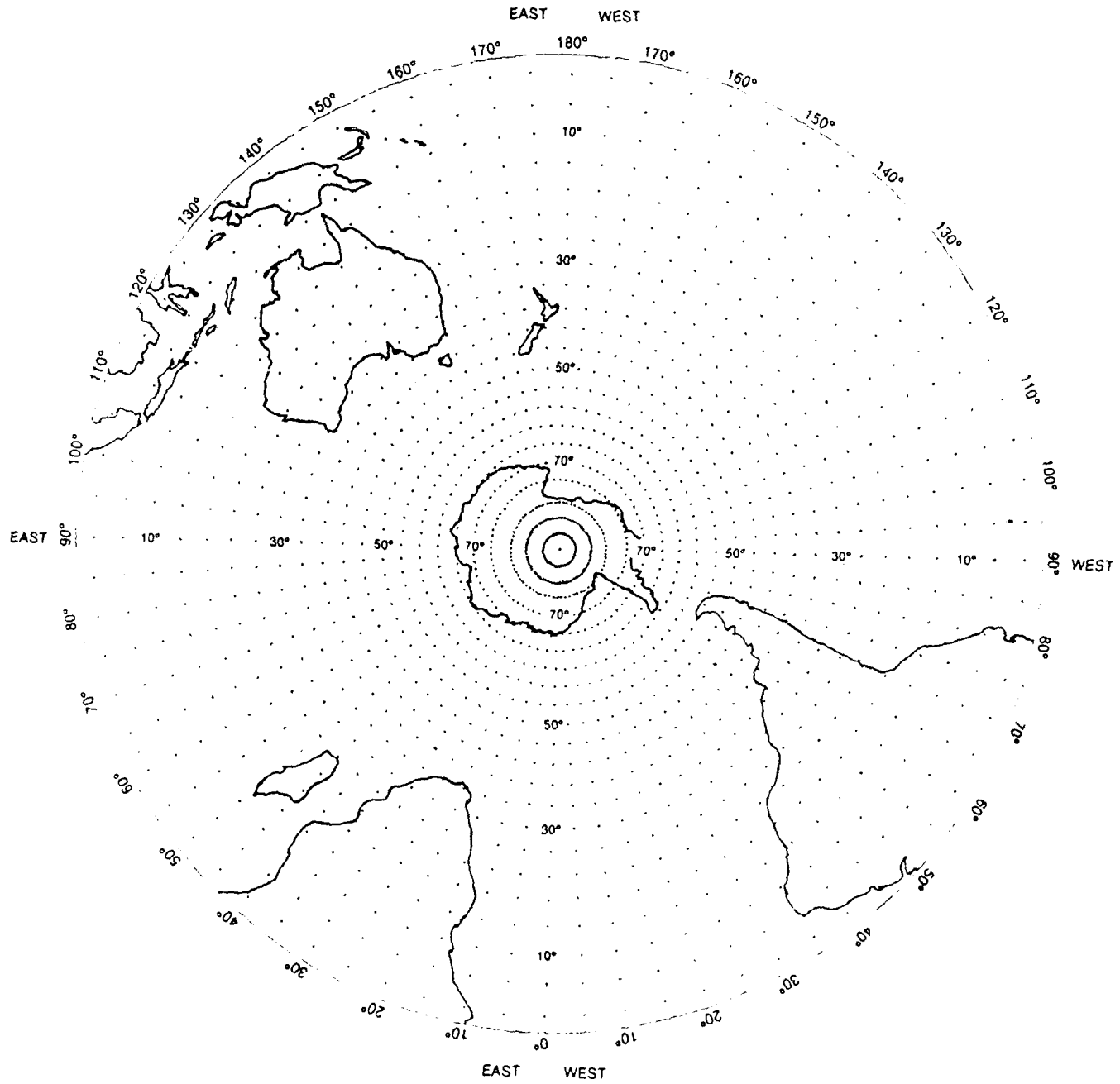


Fig. A.2--Map grid of Southern Hemisphere

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